

**IN THE UNITED STATES PATENT AND  
TRADEMARK OFFICE**

PATENT

Applicant(s): Rodgers, et al.                      Docket No.: 32329.00027  
Application No.: Not Assigned Yet              Group Art Unit: Not Assigned Yet  
Filing Date:    Examiner: Not Assigned Yet  
TITLE                      OBJECT IDENTIFICATION SYSTEM WITH  
                                 ADAPTIVE TRANSCEIVERS AND METHODS OF OPERATION

**PRELIMINARY AMENDMENT**

Commissioner for Patents  
Washington, DC 20231

Commissioner:

Prior to examination please amend the subject application as follows:

In the Drawing

Please replace drawing sheets 24/33, 28/33, and 29/33 showing Figs. 26, 27, 32, and 33 with the enclosed drawing sheets showing corrected Figs. 26, 27, 32, and 33.

In the Specification

Replace the paragraph starting on page 1, line 11 with the following paragraph:

This application is a Divisional application of, and claims priority from, U.S. patent application no. 09/372,274 by Rodgers, et al., filed August 11, 1999, which is a Continuation-In-Part application of, and claims priority from, U.S. Patent Application Serial Number 09/233,755 by Rodgers, et al., filed on January 20, 1999, which is a Continuation-In-Part application of U.S. Patent Application Serial Number 09/088,924, by Rodgers, et. al, filed on June 2, 1998, now abandoned. These related applications are incorporated herein by reference.

Replace the paragraph starting at page 3, line 10 with the following paragraph:

The monitor may further include a second receiver providing phase detection, or a signal analyzer providing phase detection. Phase detection provides phase information regarding the received response signal. The processor may further determine the second frequency in accordance with the phase information. Phase information varies over a wider range of values near a resonant frequency. By determining the second frequency in accordance with phase information, the second frequency may be more accurately determined. Communication with a more accurate second frequency improves the efficiency of transferring operative power to a transceiver, permits faster or more accurate identification of transceivers, extends the operating range of the monitor, overcomes problems of detrimental orientation discussed above, or permits faster or more accurate data transfer between the monitor and a single transceiver.

Replace the paragraph starting on page 50, line 2 with the following paragraph:

TABLE 6

Transmitter Type	Reply Frequency
Colpitts Oscillator	Tank resonant frequency when transceiver operates in isolation; any stack resonant frequency when within a stack; between tank resonant frequency and stack resonant frequency when loosely coupled to a stack (e.g., on an end or in non-coplanar orientation).
Phase Locked Loop	As driven by carrier from monitor 124 (e.g., at an isolated tank resonant frequency, a stack resonant frequency, or any other desirable frequency). The carrier frequency may be selected for any one or more of the following reasons: (a) to avoid the carrier being masked by interfering frequency components (e.g., of antenna system 121, or of signal 193); (b) to avoid the reply being masked by interfering frequency components (e.g., of antenna system 121 or of signal 193); (c) to assure adequate power transfer to enable one or

Transmitter Type	Reply Frequency
	more transceivers; and (d) to prevent adequate power transfer or adequate received signal quality from enabling one or more transceivers not currently of interest. For example, if a stack resonant frequency has been detected at 4.3 MHz, the monitor may transmit at a predetermined offset (e.g., less 500 KHz) from 4.3 MHz to interrogate a transceiver loosely coupled to the stack (e.g., at an end of a linear stack) whether or not a response (e.g., a ring signal) was detected at that offset.

Replace the paragraph starting on page 58, line 30 with the following paragraph:

TABLE 7

Command/Answer	Description
N <Antenna Node> <Antenna Address> <Antenna Mode> <Gain> <Frequency>	Direct the set up and selection of antennas for a monitor to use in a specified mode (e.g., transmit, receive, test). Set antenna node RF channel operating parameters. Specify a frequency for antenna node tuner to use to tune the selected antenna(s).
No answer.	An acknowledge answer may be used.
G <Squelch delay> <Squelch width> <Receive delay> <DSP Start-up Delay> <DSP Sample Count> <DSP Mode> <Ch. A Mode> <Ch. A Signal Source> <Ch. A Gain> <Ch. A Filtering> <Ch. A Clock> <Ch. A Output> {etc. for Ch. B}	Specify Monitor receiver operating parameters and analog switch settings. Squelch delay facilitates beginning squelch at a zero crossing of energy on the antenna(s) to be squelched. Squelch width corresponds to duration D434. Receive delay may direct beginning receiving on or after the T416 (e.g., at times A or B as discussed above). DSP sample count conveys

Command/Answer	Description
No answer.	<p>the number of samples to be taken (e.g. 32 :sec window for FFT calculation). DSP mode may be as defined by an integrated circuit DSP (e.g., TI320 marketed by Texas Instruments). Ch. A/B mode may direct transmit, receive, or both (loop back) Ch. A/B Signal Source may select same source for two receive channels. Ch. A/B clock source may direct frequency and phase (e.g., 0°, +90°) for signal SC. Ch. A/B output may direct which of several detectors is/are used.</p> <p>An Acknowledge answer may be used.</p>
<p>C {Ch. A antenna arguments} {Ch. B antenna arguments} &lt;Start frequency&gt; &lt;End frequency&gt; &lt;Frequency stepping&gt;</p> <p>{&lt;Ch. A Detector Output at Bin p&gt;} ... {&lt;Ch. B Detector Output at Bin q&gt;} ...</p>	<p>Directs the set up and selection of antennas for each (e.g., A and B) receiver in the Monitor with arguments similar to N command.</p> <p>Requests amplitude results (e.g., received amplitude or received power) from each receiver in a specified range of frequencies (i.e., bins) by specifying the bin number range to be reported (e.g., from bin 123 to bin 885). May specify an increment between bins (e.g., report every fifth bin).</p> <p>Reports up to 1024 amplitude values for each channel (e.g., p = 0 to 1023; and q = 0 to 1023). May substitute DSP output when FFT results are desired.</p>
O {<Header> <Level> <Access Code>} ...	Interrogate a group, subgroup, or particular transceiver. The list Header may define a sequence and number of arguments (e.g., level

Command/Answer	Description
	and access code) in the O command. One or more N command arguments may precede the list.
{<Ch. A at Reply Slot p>} ... {<Ch. B at Reply Slot q>} ...	An integer for each of two receive channels (e.g., A and B) is provided for each of 1024 reply slots (e.g., p = 0 to 1023; q = 0 to 1023). Result depends on G and N command values for antenna, receiver, and DSP operating modes. The integer may represent any of the following: (a) whether amplitude (or power) exceeded a threshold value; (b) a magnitude of a detected amplitude (or power); (c) a magnitude of a frequency component (e.g., as provided by an FFT calculation). In an expanded version, the answer may include a list of integers for each integer in (b) for time domain sampling and (c) for frequency domain results.

Replace the paragraph starting on page 65, line 4 with the following paragraph:

TABLE 9

Command/Answer	Description
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Command/Answer	Description
A <Antenna Node Address>	Read status of input register(s) (e.g., manual switches), status of output register(s) (e.g., current matrix switch settings, squelch settings, tuner settings, RF channel settings, feedback settings, any memory address (e.g., antenna node software version, tuner calibration date, number of installed antennas, etc.).
<Antenna Node Address> <Answer Data Length> <Answer Data> <Checksum>	Several different commands may be used to obtain status in part.
B <Antenna Node Address> <Settings Data Length> <Settings Data> <Checksum>	Set output register(s) contents to specify antenna configuration, antenna(s) coupling to transceiver channel(s), squelch settings for each channel, tuner settings for each channel, feedback settings for each channel.
No answer.	An Acknowledge answer may be used.
C <Antenna Node Address> <Configuration Data Length> <Configuration Data> <Checksum>	Set configuration data in memory including antenna node address, antenna addresses, function(s) to be executed on manual switch closure, table of tuning settings (e.g., relay closures vs. frequency), table of antenna settings (e.g., relay closures vs. frequency or configuration identifier), any memory address (e.g., tuner calibration date, number of installed antennas, etc.).
No answer.	Several different commands may be used to specify configuration in part. An Acknowledge answer may be used.

Replace the paragraph starting on page 67, line 8 with the following paragraph:

Output register 2910 receives data from data bus 2906, stores such data, and maintains output signals in accordance with stored data. Signals provided by output register 2910 direct operation of coupler 2912 and transceive channels 2918. Output register signals on line 2913 control coupler 2912 (e.g., configuration and matrix switch operations). Squelch command signals on line 2921 direct antenna squelching functions of squelch circuit 2920. Tuning signals on line 2923 direct tuning functions of tuner 2922. Finally, digital signals on line 2927 control operation of transceiver channels 2924 (e.g., specifying preamplifier gain, automatic gain control, and filter transfer functions). Output register signals on lines 2913, 2921, 2923, and 2927 are binary digital signals and may be used in common across multiple transceive channels 2918, or additional digital signals may be provided by output register 2910 for each transceive channel.

Replace the paragraph starting on page 74, line 10 with the following paragraph:

Antenna 3401 is constructed in the plane defined by points A, B, C, D, i.e., in a plane parallel to the XZ plane at the opening of the passage furthest on the Y axis from origin 3510. Antenna 3402 is parallel to antenna 3401 yet closer to origin 3510. Movement of a transceiver along an axis through the passage parallel to the y axis may be determined by examination of the time when the peak reply signal strength is received from each of antennas 3401 and 3402. Antenna 3403 is again parallel to the XZ plane and in addition exists at the mid-point of the passage (e.g., each point J, K, L, exists at the mid-point of a segment NB, OC, PD parallel to the Y axis). Antenna 3404 may be arranged at an angle  $\alpha = 45^\circ$  when passage 3500 is essentially cubic in geometry. Similarly, antenna 3405 may be perpendicular to antenna 3404 when passage 3500 is essentially cubic. Antenna 3406 is oriented in a plane having angles  $\alpha = 135^\circ$  and  $\gamma = 135^\circ$  and is of the type described in related patent application S/N 09/233,755, cited above. Antenna 3407 has an orientation complimentary to antenna 3406. Antenna 3408 lies in a plane parallel to the ground plane 3501. Antenna 3409 and antenna 3410 are parallel to the YZ plane and may be constructed in sides 3506 and 3507, respectively.

Replace the paragraph starting on page 74, line 24 with the following paragraph:

Transceive channel circuitry, particularly squelch circuit 2920 should be located as specified in the Table for optimum performance (minimal generation of out-of-band noise). Points T, U, and V bisect segments LK, HG, and DC respectively. Point S bisects segment PK.

Replace the paragraph starting on page 74, line 31 with the following paragraph:

Any antenna of antennas 150 may be constructed of multiple loops as a planar antenna. Particular advantages are obtained in system 100 by using an antenna of the type described in FIG. 36. Antenna 3600 includes three loops and terminals 3601, 3602, 3603 referenced to a common terminal 3611. Loops may be formed of any conductor including a shielded conductor for limiting E-field radiation while sending or receiving magnetic field radiation. In addition, antenna 2916 includes Q modifying circuit 3604. Q modifying circuit 3604 includes diode D3612, diode D3614, and resistor R3616, all connected in parallel from terminal 3610 to terminals 3611. In operation, a transmit signal, for example, signal TRA on line 2925 through coupler 2912, may be imposed across two terminal: a first selected from the set consisting of terminals 3601, 3602, and 3603; and a second selected from the set consisting of 3610 and 3611. When terminal 3610 is used, a transmit signal of suitable magnitude may forward bias diodes D3612 and D3614 to shunt resistor R3616. A relatively high Q antenna circuit results. On the other hand, a signal received by antenna 2916 having a signal magnitude insufficient to forward bias diodes D3612 and D3614 will pass through resistor R3616. A relatively low Q antenna circuit results. A lower Q antenna is typically characterized by a wider band sensitivity than a higher Q antenna. When transmitting energy intended to power one or more transceivers, a higher Q antenna is preferred.



## In the Claims

Please cancel claim 1 without prejudice and add the following new claims:

2. A system comprising:

a. a first circuit comprising a first detector for detecting events of a first type via a provided antenna, the first circuit providing a first signal in response to detection, an event of the first type comprising at least one of presence of a provided radio frequency identification device and identification of the provided radio frequency identification device;

b. a second circuit comprising a second detector for detecting events of a second type via a provided sensor, the second circuit providing a second signal in response to detection, an event of the second type comprising at least one of recognition of a bar code and detecting operation of a door; and

c. a monitor that provides indicia of the occurrence of events in accordance with a selected configuration wherein provision of indicia is responsive to:

(1) the first signal when the selected configuration is a first configuration; and

(2) the second signal when the selected configuration is a second configuration.

3. A system comprising:

a. a monitor; and

b. a plurality of antenna controllers coupled to the monitor via a network, the plurality comprising:

(1) a first antenna controller comprising a first interface for coupling a first antenna to the first antenna controller, wherein the first antenna controller provides indicia of radio frequency identification to the monitor, and

(2) a second antenna controller comprising a second interface for coupling a second antenna to the second antenna controller and a third interface for coupling a provided sensor to the antenna controller, wherein the second antenna controller provides indicia of radio frequency identification to the monitor and provides indicia via the sensor of at least one of a bar code and operation of a door; wherein

13 c. each antenna controller of the plurality operates its respective interfaces in  
14 accordance with commands provided by the monitor via the network and identified to the  
15 respective antenna controller by a respective address.

1 4. An antenna controller having an address, the antenna controller comprising:

- 2 a. a network interface for coupling the antenna controller to a provided  
3 monitor;
- 4 b. an antenna interface for coupling a provided antenna to the antenna  
5 controller;
- 6 c. a sensor interface for coupling a provided sensor to the antenna controller,  
7 the sensor for providing to the antenna controller indicia of at least one of a bar code or operation  
8 of a door;
- 9 d. a radio frequency amplifier coupled to the antenna interface for amplifying a  
10 signal from the antenna;
- 11 e. a processor coupled to the network interface, to the amplifier, and to the  
12 sensor interface, wherein:
- 13 f. the processor enables the amplifier to receive the signal from the antenna in  
14 accordance with a command received via the network and identified to the antenna controller by  
15 the address; and
- 16 g. the processor receives via the network interface a request from the monitor  
17 identified to the antenna controller by the address, and in response reports to the monitor in  
18 accordance with the indicia.

1 5. A system comprising:

- 2 a. a monitor; and
- 3 b. a plurality of antenna controllers coupled to the monitor via a network, an  
4 antenna controller of the plurality comprising:
  - 5 (1) a coupler;
  - 6 (2) a radio frequency amplifier; and
  - 7 (3) a plurality of interfaces, each for coupling a provided antenna to  
8 the coupler; wherein

9 c. in response to a command received from the monitor via the network and  
10 identified to the antenna controller by a respective address, the coupler couples at least one  
11 antenna interface to the amplifier for amplifying a signal from an antenna interface identified by  
12 the command.

1 6. An antenna controller having an address, the antenna controller comprising:

2 a. a network interface for coupling the antenna controller to a provided  
3 monitor;

4 b. a coupler;

5 c. a radio frequency amplifier; and

6 d. a plurality of interfaces, each for coupling a provided antenna to the  
7 coupler; wherein

8 e. in response to a command received from the monitor via the network  
9 interface and identified to the antenna controller by a respective address, the coupler couples at  
10 least one antenna interface to the amplifier for amplifying a signal from an antenna interface  
11 identified by the command.

12 7. A system comprising:

1 a. a monitor; and

2 b. a plurality of antenna controllers coupled to the monitor via a network, an  
3 antenna controller of the plurality comprising:

4 (1) a coupler;

5 (2) a radio frequency amplifier having an input;

6 (3) a plurality of interfaces, each for coupling a provided antenna to  
7 the coupler;

8 (4) a memory; and

9 (5) a plurality of reactive elements selectively coupled in accordance  
10 with contents of the memory to the input of the amplifier; wherein

11 c. in response to at least one command received from the monitor via a  
12 network and identified to the antenna controller by a respective address, the coupler couples at  
13 least one antenna interface to the amplifier and the memory provides contents for selectively  
14 coupling at least one of the reactive elements to the amplifier input.  
15

1 8. An antenna controller having an address, the antenna controller comprising:  
2 a. a network interface for coupling the antenna controller to a provided monitor;  
3 b. a coupler;  
4 c. a radio frequency amplifier having an input; and  
5 d. a plurality of interfaces, each for coupling a provided antenna to the coupler;  
6 wherein  
7 e. a memory; and  
8 f. a plurality of reactive elements selectively coupled in accordance with  
9 contents of the memory to the input of the amplifier; wherein  
10 g. in response to at least one command received from the monitor via a network  
11 and identified to the antenna controller by a respective address, the coupler couples at least one  
12 antenna interface to the amplifier and the memory provides contents for selectively coupling at  
13 least one of the reactive elements to the amplifier input.

14 9. A system comprising:  
15 a. a monitor; and  
16 b. a plurality of antenna controllers coupled to the monitor via a network, an  
1 antenna controller of the plurality comprising:  
2 (1) a coupler;  
3 (2) a radio frequency amplifier having an input;  
4 (3) a plurality of interfaces, each for coupling a provided antenna to  
5 the coupler;  
6 (4) a memory; and  
7 (5) a plurality of reactive elements selectively coupled in accordance  
8 with contents of the memory to the input of the amplifier; wherein  
9 in response to at least one command received from the monitor via a network and identified to  
10 the antenna controller by a respective address, the coupler couples at least one antenna interface  
11 to the amplifier, the memory stores updated contents provided via the network interface, and the  
12 memory provides contents for selectively coupling at least one of the reactive elements to the  
13 amplifier input.

1 10. An antenna controller having an address, the antenna controller comprising:  
2 a. a network interface for coupling the antenna controller to a provided monitor;

- b. a coupler;
- c. a radio frequency amplifier having an input; and
- d. a plurality of interfaces, each for coupling a provided antenna to the coupler;

wherein

- e. a memory; and
- f. a plurality of reactive elements selectively coupled in accordance with

contents of the memory to the input of the amplifier; wherein  
in response to at least one command received from the monitor via a network and identified to  
the antenna controller by a respective address, the coupler couples at least one antenna interface  
to the amplifier, the memory stores updated contents provided via the network interface, and the  
memory provides contents for selectively coupling at least one of the reactive elements to the  
amplifier input.

11. A system comprising:

- a. a monitor; and
- b. a plurality of antenna controllers coupled to the monitor via a network, an

antenna controller of the plurality comprising:

- (1) a coupler;
- (2) a radio frequency amplifier having an input;
- (3) a plurality of interfaces, each for coupling a provided antenna to

the coupler; and

- (4) a squelch circuit coupled to the coupler; wherein

in response to at least one command received from the monitor via the network and identified to  
the antenna controller by a respective address, the coupler couples at least one antenna interface  
to the squelch circuit and to the amplifier input, and the squelch circuit is operated to dissipate  
energy from the antenna interface prior to normal operation of the amplifier.

12. An antenna controller having an address, the antenna controller comprising:

- a. a network interface for coupling the antenna controller to a provided monitor;
- b. a coupler;
- c. a radio frequency amplifier having an input;
- d. a plurality of interfaces, each for coupling a provided antenna to the coupler;

and

7 e. a squelch circuit coupled to the coupler; wherein  
8 in response to at least one command received from the monitor via the network and identified to  
9 the antenna controller by a respective address, the coupler couples at least one antenna interface  
10 to the squelch circuit and to the amplifier input, and the squelch circuit is operated to dissipate  
11 energy from the antenna interface prior to normal operation of the amplifier.

1 13. A system comprising:

2 a. a monitor; and

3 b. a plurality of antenna controllers coupled to the monitor via a network, a first  
4 antenna controller of the plurality coupled to a second antenna controller of the plurality, each  
5 antenna controller of the plurality comprising:

6 (1) a coupler;

7 (2) a radio frequency amplifier having an input and an output;

8 (3) a plurality of interfaces, each for coupling a provided antenna to  
9 the coupler;

10 (4) an I/O interface for receiving an input signal to the antenna  
11 controller and for providing an output signal from the antenna controller; and

12 (5) a difference circuit having first and second inputs and an output  
13 driven by the difference circuit as the algebraic difference of signals respectively from the first  
14 and second inputs; wherein

15 in response to at least one command received from the monitor via the network and identified to  
16 the antenna controller by a respective address, the coupler couples at least one antenna interface  
17 to the amplifier input, the input signal of the I/O interface is coupled to the first input of the  
18 difference circuit, the output of the amplifier is coupled to the second input of the difference  
19 circuit, and the output signal of the I/O interface is provided in accordance with the output of the  
20 difference circuit.

1 14. An antenna controller having an address, the antenna controller comprising:

2 a. a network interface for coupling the antenna controller to a provided monitor;

3 b. a coupler;

4 c. a radio frequency amplifier having an input and an output;

5 d. a plurality of interfaces, each for coupling a provided antenna to the coupler;

6 e. an I/O interface for receiving an input signal to the antenna controller and for  
7 providing an output signal from the antenna controller; and  
8 f. a difference circuit having first and second inputs and an output driven by the  
9 difference circuit as the algebraic difference of signals respectively from the first and second  
10 inputs; wherein  
11 in response to at least one command received from the monitor via the network and identified to  
12 the antenna controller by a respective address, the coupler couples at least one antenna interface  
13 to the amplifier input, the input signal of the I/O interface is coupled to the first input of the  
14 difference circuit, the output of the amplifier is coupled to the second input of the difference  
15 circuit, and the output signal of the I/O interface is provided in accordance with the output of the  
16 difference circuit.

1 15. A system comprising:  
2 a. a monitor; and  
3 b. a plurality of antenna controllers coupled to the monitor via a network, each  
4 antenna controller of the plurality providing an output signal to the monitor via a respective line,  
5 each antenna controller of the plurality comprising:  
6 (1) a first and a second coupler;  
7 (2) a first and a second radio frequency amplifier;  
8 (3) a plurality of interfaces, each for coupling a provided antenna to  
9 the coupler;  
10 (4) an output interface for providing the output signal from the antenna  
11 controller; and  
12 (5) a difference circuit having first and second inputs and an output  
13 driven by the difference circuit as the algebraic difference of signals respectively from the first  
14 and second inputs; wherein  
15 in response to at least one command received from the monitor via the network and identified to  
16 the antenna controller by a respective address, the first coupler couples at least one respective  
17 antenna interface to each of the first and the second amplifiers respectively, the second coupler  
18 couples each amplifier output to a respective input of the difference circuit and couples the  
19 output of the difference circuit to the output interface.

1 16. An antenna controller having an address, the antenna controller providing an output  
2 signal to the monitor via a line, the antenna controller comprising:  
3 a. a first and a second coupler;  
4 b. a first and a second radio frequency amplifier;  
5 c. a plurality of interfaces, each for coupling a provided antenna to the coupler;  
6 d. an output interface for providing the output signal from the antenna controller;  
7 and  
8 e. a difference circuit having first and second inputs and an output driven by the  
9 difference circuit as the algebraic difference of signals respectively from the first and second  
10 inputs; wherein  
11 f. in response to at least one command received from the monitor via the  
12 network and identified to the antenna controller by a respective address, the first coupler couples  
13 at least one respective antenna interface to each of the first and the second amplifiers  
14 respectively, the second coupler couples each amplifier output to a respective input of the  
15 difference circuit and couples the output of the difference circuit to the output interface



Remarks

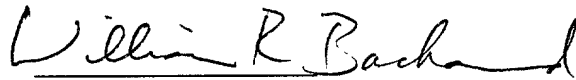
The present application is a divisional application of pending application 09/372,274 (the "parent") by Rodgers, et al. filed on August 11, 1999. On entry of this amendment, claims 2-16 are pending. The specification has been amended to remove typographical errors. The drawing is amended as shown in the enclosed marked up copy of sheets 24/33, 28/33, and 29/33. Substitute drawing sheets are enclosed for use in examination. A Letter to the Official Draftsperson is enclosed with substitute drawing sheets for entry. A marked-up version of the amendment to the specification is enclosed. No marked up copy of the claims is deemed necessary since only new claims are now pending. No new matter is submitted.

The Examiner is invited to telephone the undersigned at the telephone number listed below if it would in any way advance prosecution of this case.

Respectfully submitted,

Date:

August 2, 2001



William R. Bachand  
Reg. No. 34,980

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## Version with Markings to Show Changes Made

### In the Specification

The paragraph starting on page 1, line 11 was modified as follows:

This application is a Divisional application of, and claims priority from, U.S. patent application no. 09/372,274 by Rodgers, et al., filed August 11, 1999, which is a Continuation-In-Part application of, and claims priority from, U.S. Patent Application Serial Number 09/233,755 by Rodgers, et al., filed on January 20, 1999, which is a Continuation-In-Part application of U.S. Patent Application Serial Number 09/088,924, by Rodgers, et. al, filed on June 2, 1998[.], now abandoned. These related applications are incorporated herein by reference..

The paragraph starting on page 3, line 10 was modified as follows:

The monitor may further include [the second] a second receiver providing phase detection, or a signal analyzer providing phase detection. Phase detection [providing] provides phase information regarding the received response signal. The processor may further determine the second frequency in accordance with the phase information. Phase information varies over a wider range of values near a resonant frequency. By determining the second frequency in accordance with phase information, the second frequency may be more accurately determined. Communication with a more accurate second frequency improves the efficiency of transferring operative power to a transceiver, permits faster or more accurate identification of transceivers, extends the operating range of the monitor, overcomes problems of detrimental orientation discussed above, or permits faster or more accurate data transfer between the monitor and a single transceiver.

The paragraph starting on page 50, line 2 was modified as follows:

TABLE 6

Transmitter Type	Reply Frequency
Colpitts Oscillator	Tank resonant frequency when transceiver operates in isolation; any stack resonant frequency when within a stack; between tank resonant frequency and stack resonant frequency when loosely coupled to a stack (e.g., on an end or in non-coplanar orientation).
Phase Locked Loop	As driven by carrier from monitor 124 (e.g., at an isolated tank resonant frequency, a stack resonant frequency, or any other desirable [frequency.] <u>frequency</u> ). The carrier frequency may be selected for any one or more of the following reasons: (a) to avoid the carrier being masked by interfering frequency components (e.g., of antenna system 121, or of signal 193); (b) to avoid the reply being masked by interfering frequency components (e.g., of antenna system 121 or of signal 193); (c) to assure adequate power transfer to enable one or more transceivers; and (d) to prevent adequate power transfer or adequate received signal quality from enabling one or more transceivers not currently of interest. For example, if a stack resonant frequency has been detected at 4.3 MHz, the monitor may transmit at a predetermined offset (e.g., less 500 KHz) from 4.3 MHz to interrogate a transceiver loosely coupled to the stack (e.g., at an end of a linear stack) whether or not a response (e.g., a ring signal) was detected at that offset.

The paragraph starting on page 58, line 30 was modified as follows:

TABLE 7

Command/Answer	Description
N <Antenna Node> <Antenna Address> <Antenna Mode> <Gain> <Frequency>	Direct the set up and selection of antennas for a monitor to use in a specified mode (e.g., transmit, receive, test). Set antenna node RF channel operating parameters. Specify a frequency for antenna node tuner to use to tune the selected antenna(s).
No [response]answer.	An acknowledge answer may be used.
G <Squelch delay> <Squelch width> <Receive delay> <DSP Start-up Delay> <DSP Sample Count> <DSP Mode> <Ch. A Mode> <Ch. A Signal Source> <Ch. A Gain> <Ch. A Filtering> <Ch. A Clock> <Ch. A Output> {etc. for Ch. B}	Specify Monitor receiver operating parameters and analog switch settings. Squelch delay facilitates beginning squelch at a zero crossing of energy on the antenna(s) to be squelched. Squelch width corresponds to duration D434. Receive delay may direct beginning receiving on or after the T416 (e.g., at times A or B as discussed above). DSP sample count conveys the number of samples to be taken (e.g. 32 :sec window for FFT calculation). DSP mode may be as defined by an integrated circuit DSP (e.g., TI320 marketed by Texas Instruments). Ch. A/B mode may direct transmit, receive, or both (loop back) Ch. A/B Signal Source may select same source for two receive channels. Ch. A/B clock source may direct frequency and phase (e.g., 0°, +90°) for signal SC. Ch. A/B output may direct which of several

Command/Answer	Description
No answer.	detectors is/are used. An Acknowledge answer may be used.
C {Ch. A antenna arguments} {Ch. B antenna arguments} <Start frequency> <End frequency> <Frequency stepping>	Directs the set up and selection of antennas for each (e.g., A and B) receiver in the Monitor with arguments similar to N command. Requests amplitude results (e.g., received amplitude or received power) from each receiver in a specified range of frequencies (i.e., bins) by specifying the bin number range to be reported (e.g., from bin 123 to bin 885). May specify an increment between bins (e.g., report every fifth bin).
{<Ch. A Detector Output at Bin p>} ... {<Ch. B Detector Output at Bin q>} ...	Reports up to 1024 amplitude values for each channel (e.g., p = 0 to 1023; and q = 0 to 1023). May substitute DSP output when FFT results are desired.
O {<Header> <Level> <Access Code>} ...	Interrogate a group, subgroup, or particular transceiver. The list Header may define a sequence and number of arguments (e.g., level and access code) in the O command. One or more N command arguments may precede the list.
{<Ch. A at Reply Slot p>} ... {<Ch. B at Reply Slot q>} ...	An integer for each of two receive channels (e.g., A and B) is provided for each of 1024 reply slots (e.g., p = 0 to 1023; q = 0 to 1023). Result depends on G and N command values for antenna, receiver, and DSP operating modes. The integer may represent any of the

Command/Answer	Description
	following: (a) whether amplitude (or power) exceeded a threshold value; (b) a magnitude of a detected amplitude (or power); (c) a magnitude of a frequency component (e.g., as provided by an FFT calculation). In an expanded version, the answer may include a list of integers for each integer in (b) for time domain sampling and (c) for frequency domain results.

The paragraph starting on page 65, line 4 was modified as follows:

TABLE 9

Command/Answer	Description
A <Antenna Node Address>	Read status of input register(s) (e.g., manual switches), status of output register(s) (e.g., current matrix switch settings, squelch settings, tuner settings, RF channel settings, feedback settings, any memory address (e.g., antenna node software version, tuner calibration date, number of installed antennas, etc.).
<Antenna Node Address> <Answer Data Length> <Answer Data> <Checksum>	Several different commands may be used to obtain status in part.

Command/Answer	Description
B <Antenna Node Address> <Settings Data Length> <Settings Data> <Checksum>	Set output register(s) contents to specify antenna configuration, antenna(s) coupling to transceiver channel(s), squelch settings for each channel, tuner settings for each channel, feedback settings for each channel.
No answer.	An Acknowledge answer may be used.[.]
C <Antenna Node Address> <Configuration Data Length> <Configuration Data> <Checksum>	Set configuration data in memory including antenna node address, antenna addresses, function(s) to be executed on manual switch closure, table of tuning settings (e.g., relay closures vs. frequency), table of antenna settings (e.g., relay closures vs. frequency or configuration identifier), any memory address (e.g., tuner calibration date, number of installed antennas, etc.).
No answer.	Several different commands may be used to specify configuration in part. An Acknowledge answer may be used.

The paragraph starting on page 67, line 8 was modified as follows:

Output register 2910 receives data from data bus 2906, stores such data, and maintains output signals in accordance with stored data. Signals provided by output register 2910 direct operation of coupler 2912 and transceive channels 2918. Output register signals on line 2913 control coupler 2012 [9] (e.g., configuration and matrix switch operations). Squelch command signals on line 2921 direct antenna squelching functions of squelch circuit 2920. Tuning signals on line 2923 direct tuning functions of tuner 2922. Finally, digital signals on line 2927 control

operation of transceiver channels 2924 (e.g., specifying preamplifier gain, automatic gain control, and filter transfer functions). Output register signals on lines 2913, 2921, 2923, and 2927 are binary digital signals and may be used in common across multiple transceiver channels 2918, or additional digital signals may be provided by output register 2910 for each transceiver channel.

The paragraph starting on page 74, line 10 was modified as follows:

Antenna 3401 is constructed in the plane defined by points A, B, C, D, i.e., in a plane parallel to the XZ plane at the opening of the passage furthest on the Y axis from origin 3510. Antenna 3402 is parallel to antenna 3401 yet closer to origin 3510. Movement of a transceiver along an axis through the passage parallel to the y axis may be determined by examination of the time when the peak reply signal strength is received from each of antennas 3401 and 3402. Antenna 3403 is again parallel to the XZ plane and in addition exists at the mid-point of the passage (e.g., each point J, K, L, exists at the mid-point of a segment NB, OC, PD parallel to the Y axis). Antenna 3404 may be arranged at an angle  $\alpha = 45^\circ$  when passage 3500 is essentially cubic in geometry. Similarly, antenna 3405 may be perpendicular to antenna 3404 when passage 3500 is essentially cubic. Antenna 3406 is oriented in a plane having angles  $\alpha = 135^\circ$  and  $\gamma = 135^\circ$  and is of the type described in related patent application S/N 09/233,755, cited above. Antenna 3407 has an orientation complimentary to antenna 3406. Antenna 3408 lies in a plane parallel to the ground plane 3501. Antenna 3409 and antenna 3410 are parallel to the YZ plane and may be constructed in sides 3506 and 3507, respectively.

The paragraph starting on page 74, line 24 was modified as follows:

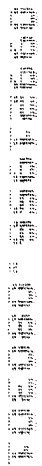
Transceiver channel circuitry, particularly squelch circuit 2920 should be located as specified in the Table for optimum performance (minimal generation of out-of-band noise). Points  $\underline{T}$ ,  $\underline{U}$ , and V bisect segments LK, HG, and DC respectively. Point  $\underline{S}$  bisects segment PK.

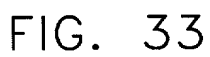


The paragraph starting on page 74, line 31 was modified as follows:

Any antenna of antennas 150 may be constructed of multiple loops as a planar antenna. Particular advantages are obtained in system 100 by using an antenna of the type described in FIG. 36. Antenna 3600 includes three loops and terminals 3601, 3602, 3603 referenced to a common terminal 3611. Loops may be formed of any conductor including a shielded conductor for limiting E-field radiation while sending or receiving magnetic field radiation. In addition, antenna 2916 includes Q modifying circuit 3604. Q modifying circuit 3604 includes diode D3612, diode D3614, and resistor R3616, all connected in parallel from terminal 3610 to [terminal]terminals 3611. In operation, a transmit signal, for example, signal TRA on line 2925 through coupler 2912, may be imposed across two terminal: a first selected from the set consisting of terminals 3601, 3602, and 3603; and a second selected from the set consisting of 3610 and 3611. When terminal 3610 is used, a transmit signal of suitable magnitude may forward bias diodes D3612 and D3614 to shunt resistor R3616. A relatively high Q antenna circuit results. On the other hand, a signal received by antenna 2916 having a signal magnitude insufficient to forward bias diodes D3612 and D3614 will pass through resistor R3616. A relatively low Q antenna circuit results. A lower Q antenna is typically characterized by a wider band sensitivity than a higher Q antenna. When transmitting energy intended to power one or more transceivers, a higher Q antenna is preferred.



[illegible]





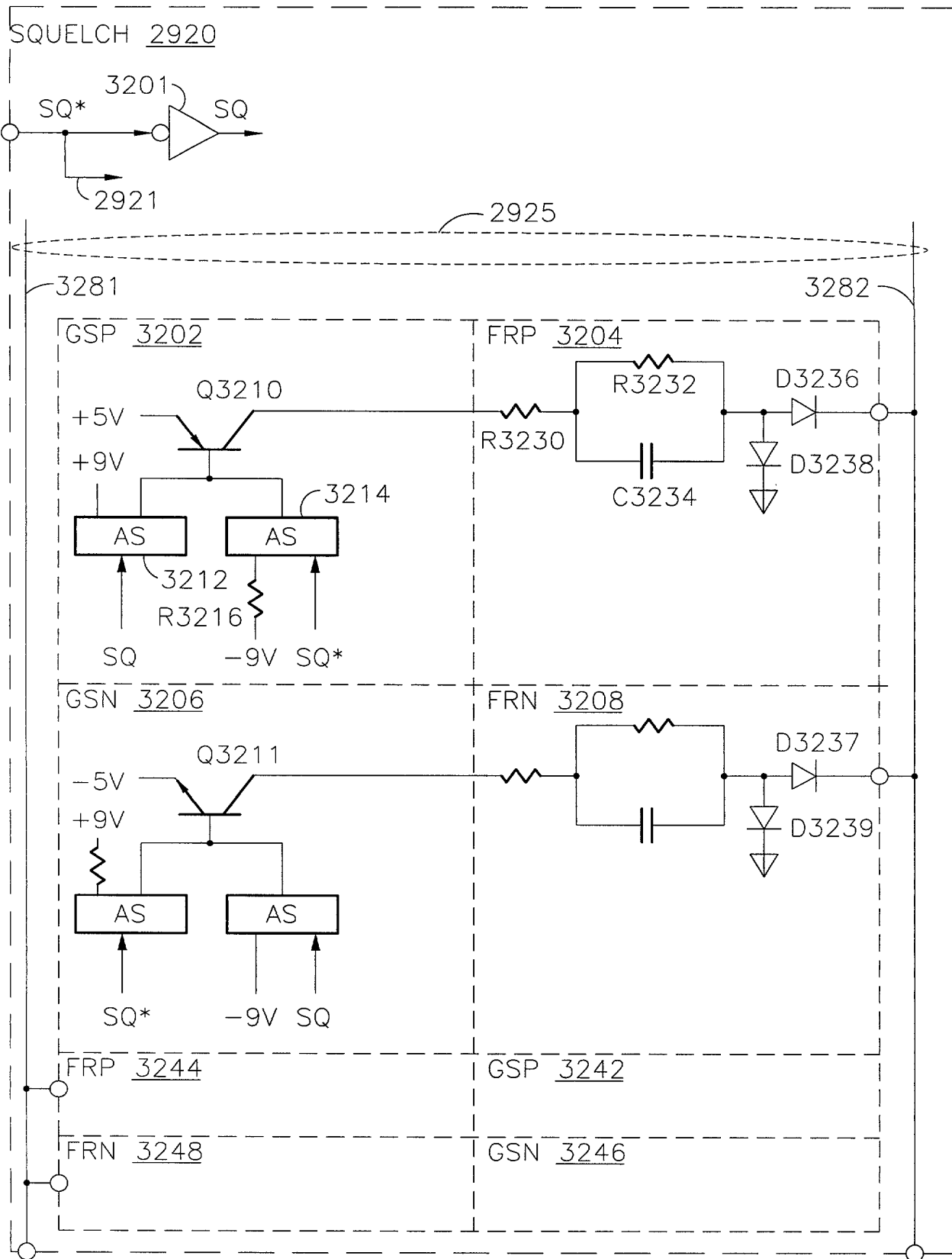


FIG. 32

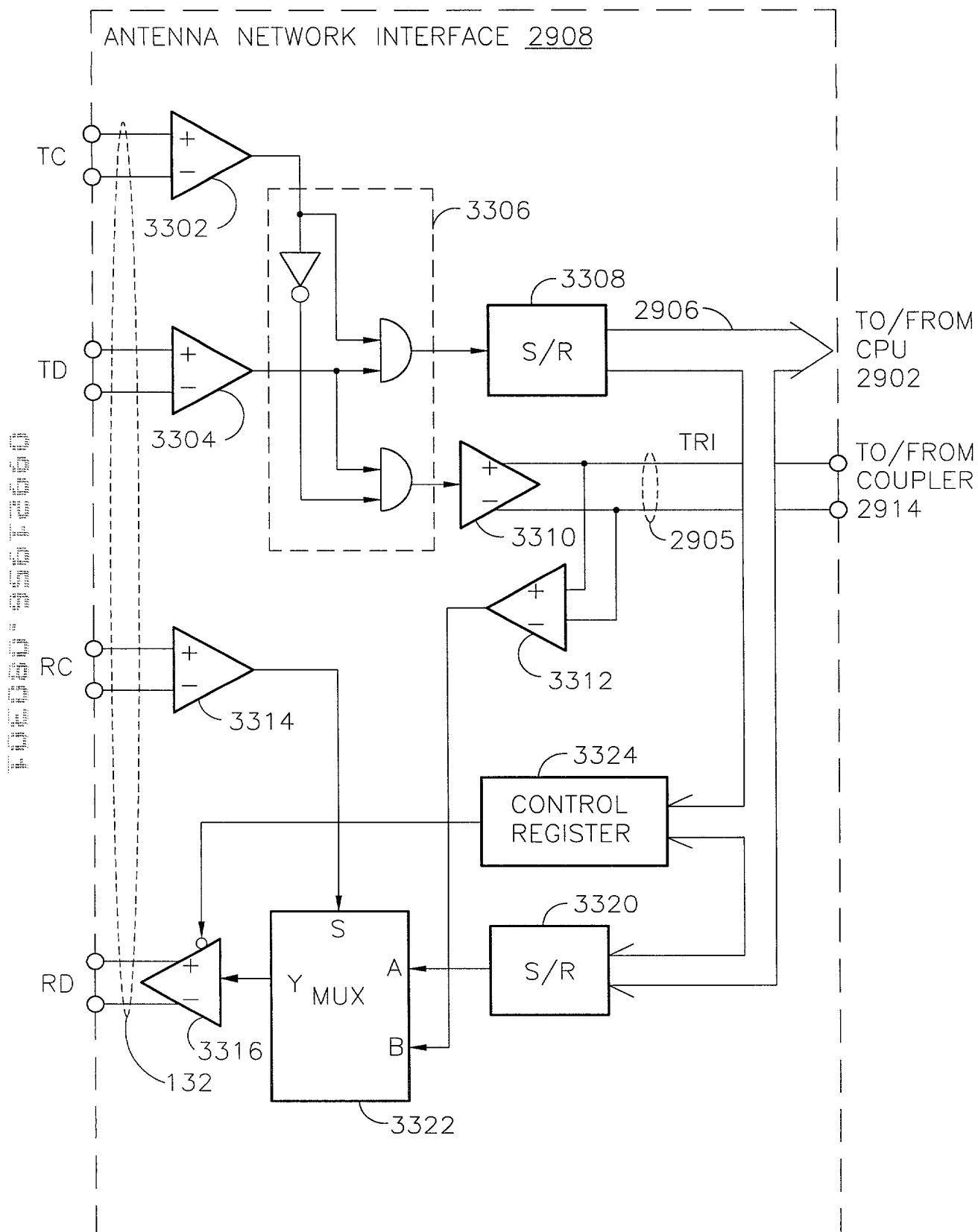


FIG. 33